The SMIRES COST Action:



advancing TRiver biomonitoring across and beyond Europe

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SMI RES Science and Management of Intermittent Rivers and Ephemeral Streams

NOTTINGHAM TRENT UNIVERSITY NTU

cost EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

The SMIRES COST Action:

Science and Management of Intermittent Rivers and Ephemeral Streams

We are 260 hydrologists, biogeochemists, ecologists, modellers, economists, and social scientists from 27 countries





Our network unites stakeholders & academics

We want to translate improved understanding of IRES into management tools





We hold focused WG meetings, fund research visits, share data and network

We are organized into 4 working groups

+ WG 1: Prevalence, distribution and trends of IRES
+ WG 2: Flow alterations, ecosystem services and management of IRES
+ WG 3: Coupled aquatic-terrestrial biogeochemistry in IRES
+ WG 4: Community ecology and biomonitoring in IRES
+ Stakeholder Committee, networking and dissemination
+ FYR: Forum of Young Researchers



– WG 4: Community ecology and biomonitoring in IRES

Leader: Rachel Stubbington

OBJECTIVES

Adapt current biomonitoring methods for IRES

Develop new biomonitoring methods for IRES

Produce an electronic handbook including guidelines and caveats for IRES biomonitoring

'COMMUNITY ECOLOGY'

Apply advances to achieve the objectives

– WG 4: Community ecology and biomonitoring in IRES

ACHIEVEMENTS

Leader: Rachel Stubbington

WORKSHOPS

Sep 16 **Planning**

Jan 17 **Dry phase** biomonitors

Jun 17 **Intermittence** sensitivity scores

Jan 18 **Metacommunity dynamics**

Oct 18 **Molecular** biomonitoring

RESEARCH VISITS

Katri Tolonen - **Freeze-flow** rivers as IRES

Ivana Pozojević - **Mites** as bioindicators

Marek Polášek - Invertebrate **trait** composition

Romain Sarremejane – Building a **trait database**

+ R + TRAIT DATABASE CALCULATION

Contents lists available at ScienceDirect

Science of the Total Environment

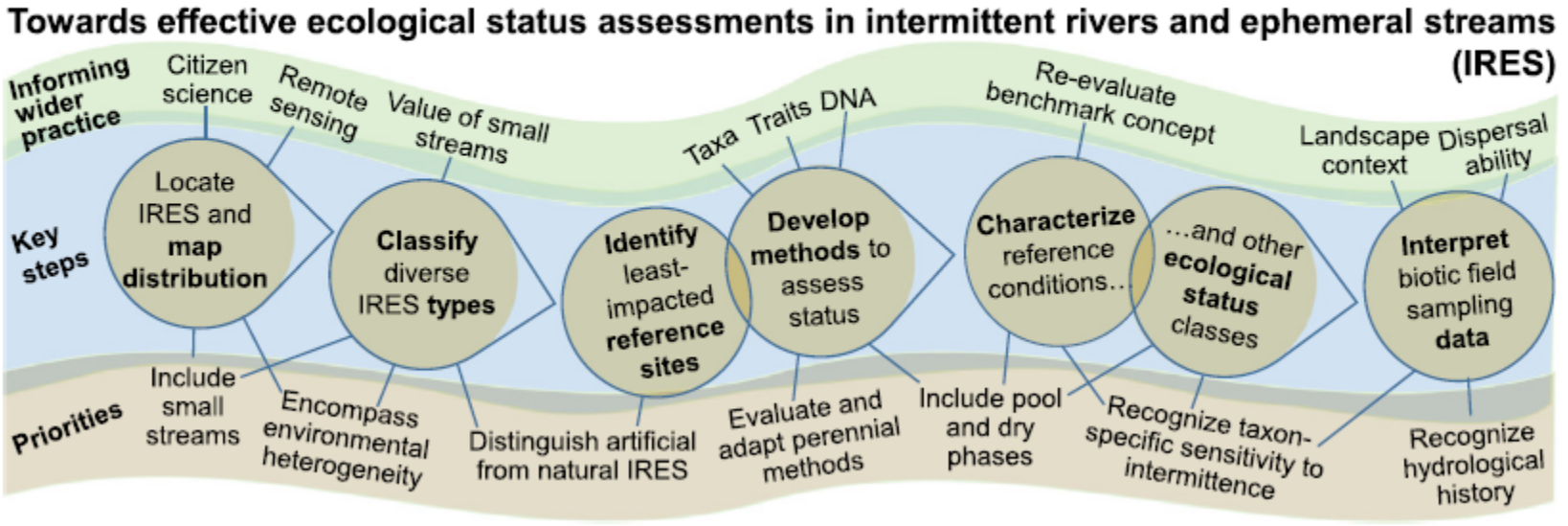
journal homepage: www.elsevier.com/locate/scitotenv

Review

Biomonitoring of intermittent rivers and ephemeral streams in Europe: Current practice and priorities to enhance ecological status assessments

Rachel Stubbington [a,*], Richard Chadd [b], Núria Cid [c], Zoltán Csabai [d], Marko Miliša [e], Manuela Morais [f], Antoni Munné [g], Petr Pařil [h], Vladimir Pešić [i], Iakovos Tziortzis [j], Ralf C.M. Verdonschot [k], Thibault Datry [l]

GRAPHICAL ABSTRACT



Biomonitors for dry phase ecological status assessment

TOOLS FOR EPHEMERAL STREAMS?

Amélie **Barthès**

Agnès **Bouchez**

Thibault **Datry**

Judy **England**

Amael **Paillex**

María del mar **Sánchez-Montoya**

Rachel **Stubbington**

Chris **Westwood**

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To find potential dry phase biomonitors we asked WG4* for data

Criteria:

1. **1** biotic group
2. Sampled during **dry phase**
3. Sites of a comparable **type**
4. Samples of **2+ ecological status types**
   - based on official monitoring / expert opinion
   - reasons for deviations from GES known
   - from ≥ 3 sites.

* WG 4: Community ecology and biomonitoring in IRES

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Data sets offered …and accepted

- Aquatic biofilms - diatoms ✓
- Aquatic invertebrates in hyporheic zone[1] ?
- Aquatic invertebrates in the seedbank ✓
- Aquatic (and terrestrial) plants ✓
- Terrestrial invertebrate communities[2] ✗
- Terrestrial beetles – carabids ✗

[1]But do these reflect dry phase status?

[2]Good / high status only (main reason for rejection)

DIATOMS - DATA

DATA: AMELIE BARTHES

* Limitations
★ Strengths

★ 6 rivers in Adour-Garonne basin, France

* 12 samples collected during dry phases

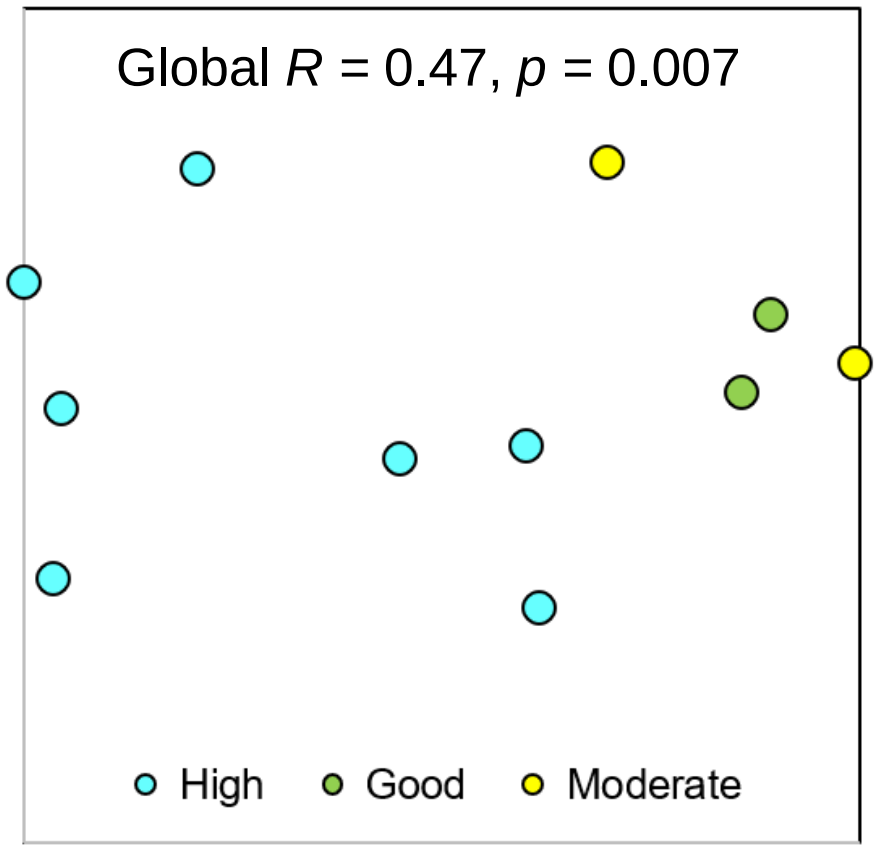
★ 42 viable taxa, almost all species

★ High (*n* = 8), good (2) and moderate (2) sites

★ Nutrient-related deviation from good status

Achnanthidium minutissimum

DIATOMS - RESULTS



Nutrient e.g. phosphate mg L^{-1} increase as status declines

IndVal

Achnanthidium minutissimum

0.99, *p* = 0.003

Mean 408, all 12 samples

Mean 10, both samples

Mean 12, both samples

Amphora species

>0.93, *p* <0.02

50 ± 31 in 4 samples

371 ± 110 in all samples

NEXT STEPS

*Water Framework Directive ecological status

PLANTS - DATA

DATA: JUDY ENGLAND, CHRIS WESTWOOD

* Limitations
★ Strengths

★ 29 aquatic / semi-aquatic species / genera

* + 2 groups: non-aquatic herbs / grasses

★ 136 dry phase surveys

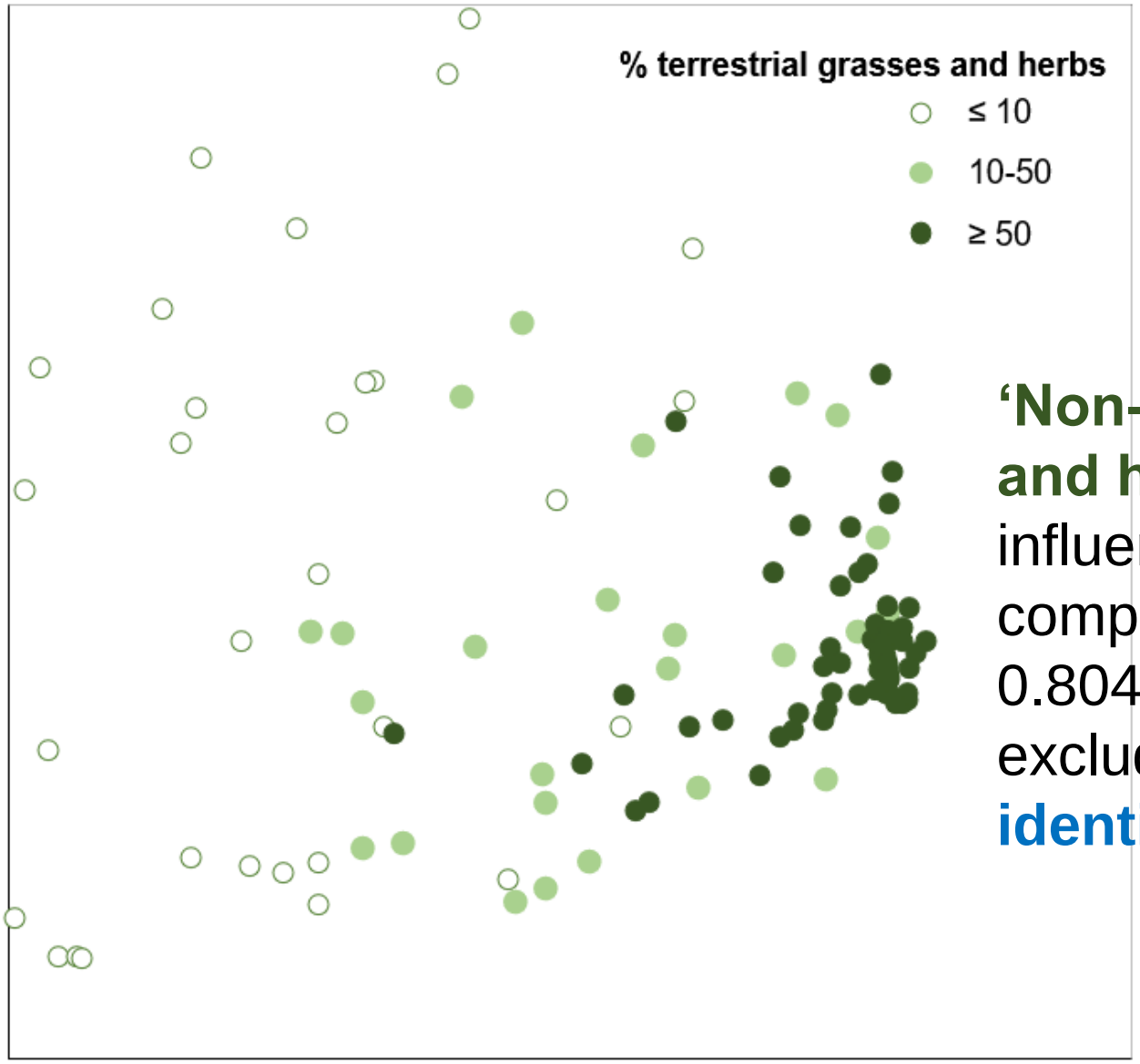
★ 15 sites in 6 UK chalk rivers

★ Status classified + ★ expert judgement…

* …shows need to supplement broad status

River Misbourne, UK chalk stream
Credit: Judy England

PLANT RESULTS with terrestrial taxa



'Non-aquatic grasses and herbs' were a big influence on community composition (Global R = 0.804, P = 0.001), so were excluded, to focus on **identified macrophytes**.

PLANTS - RESULTS



Macrophyte composition differed:

- Poached / unpoached **banks**
- Gentle / moderate **bank slopes**
- Homogeneous / heterogeneous **sediments**
- Unshaded / light / heavy **shading**
- **NOT** good /poor **water quality**

↑ Richness / diversity

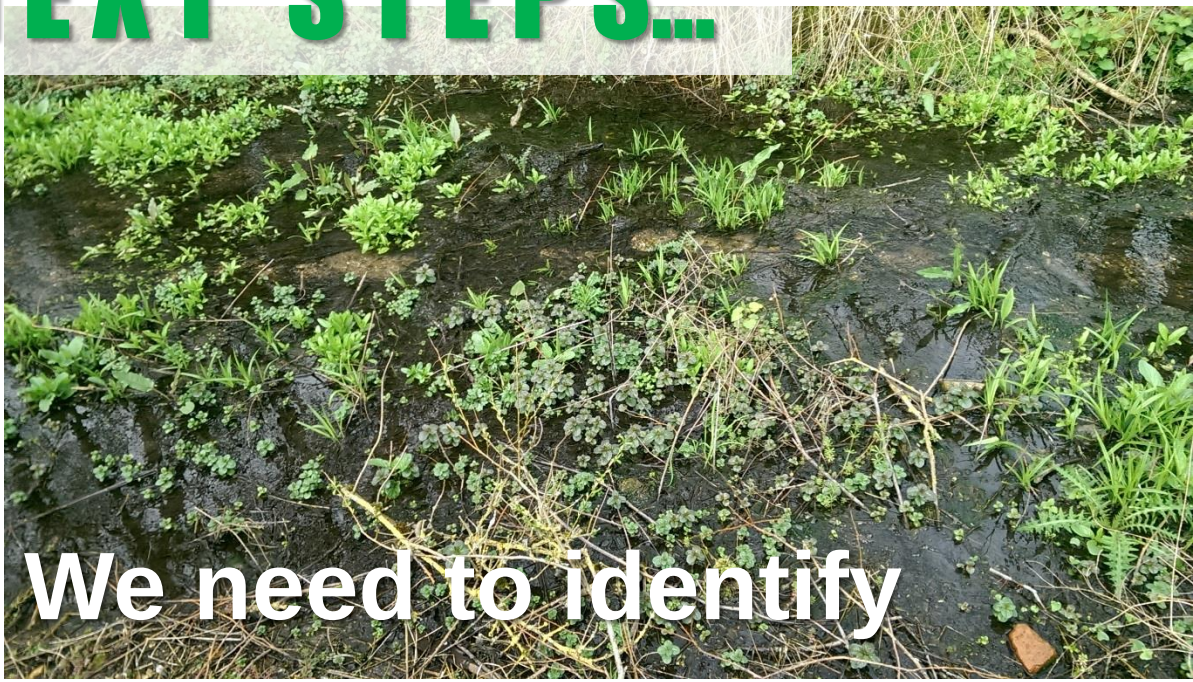
↑ Number of indicators

↑ Macrophyte cover

↓ (Terrestrial grass cover)

PLANTS - NEXT STEPS...





We need to identify



terrestrial flora

‘SEEDBANK’ - DATA

DATA: THIBAULT DATRY

= the aquatic invertebrate life stages that persist in dry sediments

- * 39 viable taxa, coarse taxonomic resolution; some genera
- 3 rivers in Bolivia
- 19 dry phase samples
- 2 sites per river – 1 mining-impacted, 1 unimpacted

LIMITATION. Intermittence co-varied with impactedness*

i.e. impacted sites are also more intermittent

‘SEEDBANK’ - RESULTS

- No compositional differences
- But differences in BMWP-like score / richness
- Coarse taxonomic resolution for abundant groups



‘SEEDBANK’ - NEXT STEPS…

Identify to a finer resolution

(aquatic / terrestrial taxa?)

NEXT STEPS

- Further exploration across **all biotic groups**
- Taxa across the **aquatic**-**terrestrial** spectrum
- Multiple stressors >> **multiple groups**
- Field work to compare sites of different **status**
- Explore **non-taxonomic** approaches e.g. traits, DNA



Holistic status assessments integrating data **from all phases**

Thanks to collaborators:

Amélie **Barthès**

Agnès **Bouchez**

Judy **England**

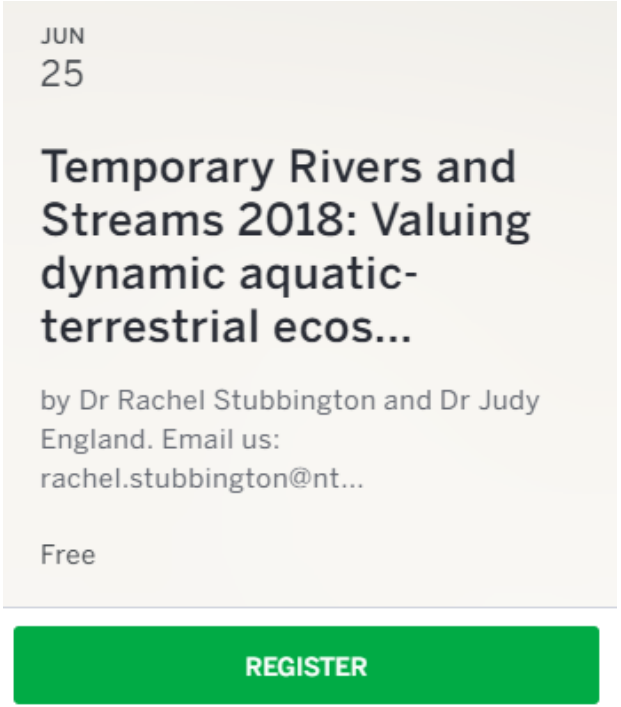
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And Working Group 4 members

UK TRIVER EVENT
25 JUNE
NOTTINGHAM



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